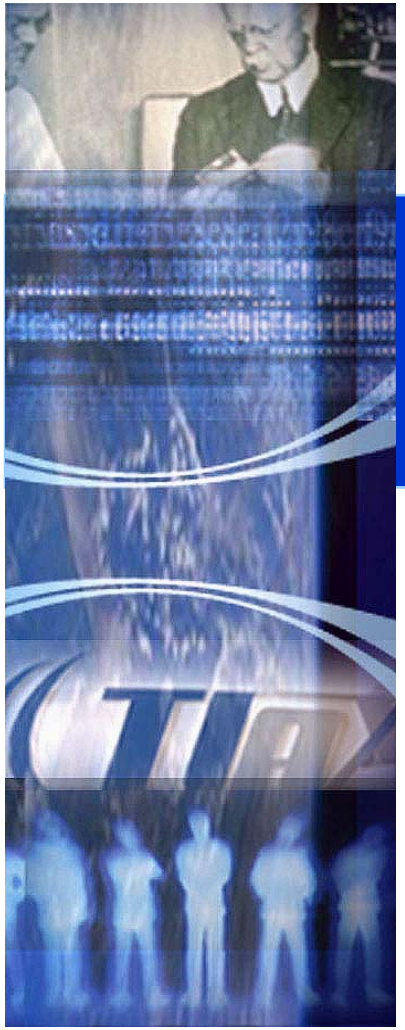

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Cost-Benefit Analysis of the Self-Generation Incentive Program (SGIP)

Staff Workshop
California Energy Commission
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2. Overview of SGIP
3. Methodology & Approach
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Background, Team, and Scope

Background

From Assembly Bill 2778:

"The bill would require the Energy Commission, on or before November 1, 2008, in consultation with the commission and the board, to evaluate the costs and benefits of providing ratepayer subsidies for renewable and fossil fuel 'ultraclean and low-emission distributed generation,' as defined, as part of the Energy Commission's integrated energy policy report."

Team

TIAX LLC (TIAX), Jack Faucett Associates (JFA), Rumla Inc. (Rumla), and Advent Consulting Associates (Advent)

Scope

Cost-Benefit Analysis of SGIP, using data for systems installed between 2001 and 2006

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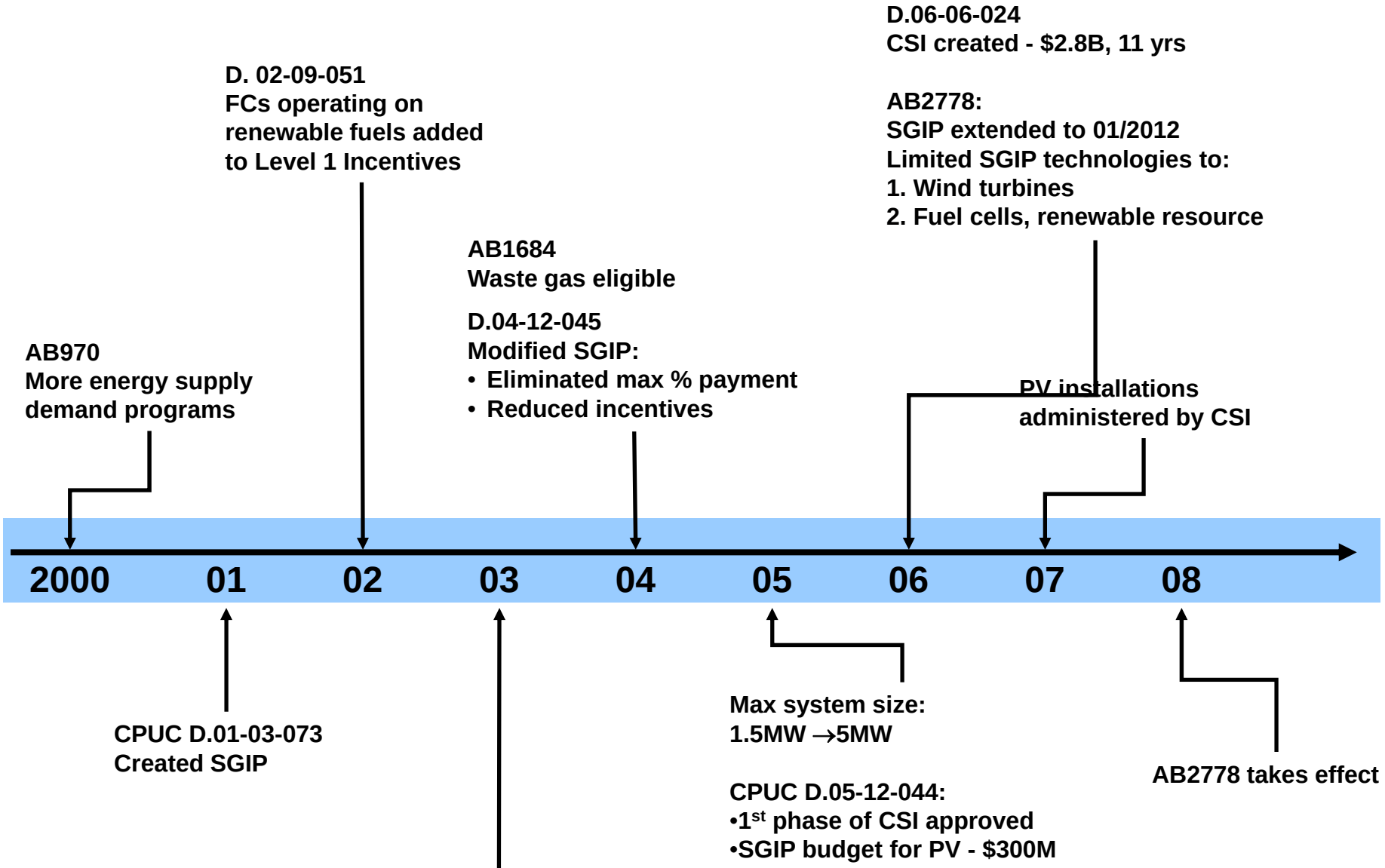

Timeline Modified from *SGIP: Program Administrator Comparative Assessment*, Summit Blue Consulting, 2007.

Status of SGIP: 12/31/2006

technology	installations	fuel	installed capacity (MW)	incentive payment ($M)
photovoltaic	609	n/a	81.1	296.9
microturbine	98	NR	13.8	non-renewable 77.9
		R	3.0	
gas turbine	3	NR	11.6	
ICE	185	NR	109.6	renewable 9.0
		R	6.3	
fuel cell	8	NR	5.8	13.2
		R	0.8	3.4
wind turbine	2	n/a	1.6	2.6
	total	**905**	**233.6**	**403**

NR-nonrenewable, R-renewable

Status of SGIP: 12/31/2006

PA	# projects	installed capacity (MW)
PG&E	439	105.1
SCE	244	46.2
SoCalGas	146	55.5
CCSE	119	26.8
total	**948**	**233.6**

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A Note on Cost-Benefit Analysis …

- Scope: Self-Generation Incentive Program
- Standing: Whose costs and benefits are counted?
- Identify the benefits and costs
  - Make sure no double counting
- Define approach to quantify benefits and costs
- Time horizon

This study differs from a conventional CBA because we are analyzing an existing program, rather than determining if a program should or should not be funded based on cost-benefit grounds. Our analysis will provide the foundation to perform a forward-looking (or traditional) CBA that will help shape SGIP in the future to ensure that the program provides net benefits.

Costs & Benefits

Costs

Installed cost

Operation and Maintenance

Administration

Metering and Evaluation

Benefits

Environmental benefits

Macroeconomic benefits

Grid benefits

Data Sources

Program Administrators and IOUs

- Basic SGIP facility data: technology type, fuel type, installed capacity, address, installed costs
- Project Cost Breakdown Worksheets
- Interconnection data: name of nearest substation, voltage of the utility interconnection line, maximum permissible line loading, annual maximum recorded line loads, transformer bank, bank loading, recorded bank loads

Itron Inc.

- Metered data: electrical net generator output (ENGO), fuel use, and waste heat recovery
- Published impact evaluation reports and other requested data

Technical Performance, by technology

Benefits are determined based on technology platform

1. Use data when you have it
2. When you don’t have metered data, be smart

Photovoltaic Installations: SDG&E

ICEs, MTs, FCs, and GTs

Capacity factors are not location-dependent. We assume that the capacity factor for installation X is the same as installation Y for a given hour.

Installation Y is a composite of all installations that have metered data at any given time.

Some ground rules …

Benefits as described here are determined as avoided damage costs, not avoided control costs. Damage costs include 1) direct damages to humans, 2) indirect damages to humans via ecosystem degradation, and 3) indirect damages to humans via non-living systems

Benefits transfer: there are potential pitfalls that we can avoid

Everything will be in 2006 dollars ($2006)

Some ground rules (continued)

A note on discounting: 7% discount rate for private investment (e.g., operations and maintenance), declining discount rate (DDR) for environmental benefits (e.g., GHGs), starting at 3.5%

Pigou referred to exponential discounting on future welfare as a ‘defective telescopic faculty’

Weitzman: “To think about the distant future in terms of standard discounting is to have an uneasy intuitive feeling that something is wrong, somewhere”

Standard discounting is contrary to sustainability

Some ground rules (continued)

Environmental benefits are determined relative to a baseline: centralized power generation. More specifically, marginal power generation. Defined here as natural gas fired combined cycle combustion turbine (NG CCCT).

The GHG emissions are determined on a lifecycle basis, across all boundaries because climate change is a global problem.

Criteria pollutant emissions are determined on a California basis and account for pollutant offsets required for NOx and PM; air quality is a local/regional problem.

Some ground rules (continued)

	emission factors[a] (NG CCCT, g/kWh)		
pollutant	total	**California**	**$/ton**
VOC	5.0E-02	**1.0E-03**	8871[b]
NOx	4.5E-02	**4.5E-03**	3408[b,c] 19458 (as PM)[c]
CO	1.3E-01	**6.3E-02**	--
SOx	7.8E-02	**0**	--
PM2.5	1.0E-02	**6.2E-03**	638184[c]
GHGs	**505**		12[d]

[a]Full Fuel Cycle Assessment, Well to Tank Energy Inputs, Emissions, and Water Impacts, Consultant Report, TIAX LLC, CEC-600-2007-003, June 2007

[b]California Strategy to Reduce Petroleum Dependence, Appendix A: Benefits of Reducing Demand for Gasoline and Diesel, Consultant Report, P600-03-005A1, Sept 2003

[c]Emission Reduction Plan for Ports and Good Movement, Appendix A: Quantification of the Health Impacts and Economic Valuation of Air Pollution from Ports and Goods Movement in California, Mar 2006

[d]Tol, RSJ. The marginal damage costs of carbon dioxide emissions: an assessment of the uncertainties, Energy Policy, 33 (2005), 2064-2074 [per metric ton]

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Photovoltaic (PV): SDG&E only

installations	92
installed capacity	12 MW
MWh generated	378,413

emission reductions, tons		**monetized value, $2006**
VOC	0.4	$2,524
NOx	1.9	$29,283
PM2.5	2.6	$1,125,995
GHGs	191 x10^3	$1,614,534
	total	**$2,772,337**

criteria pollutant emission reductions reported in short tons
GHGs reported in metric tons

Microturbines (MTs)

performance	**SDG&E**				**All**			
MWh generated	172,959				1,872,100			
MMBtu NG used	1,710,586				23,391,591			
CHP, MWh saved	5,418				74,085			
CHP, MMBtu saved	513,054				7,015,807			
emissions	**VOC**	**NOx**	**PM2.5**	**GHGs**	**VOC**	**NOx**	**PM2.5**	**GHGs**
NG used	57	87	3	114,145	774	1,195	38	1,560,892
MWh generated, offset	0	-1	-1	-87,396	-2	-9	-13	-945,965
MWh saved, offset	-2	-9	-2	-34,235	0	0	-1	-37,435
NG saved, offset	0	0	0	-2,738	-21	-122	-29	-468,156
total	**55**	**78**	**-1**	**-10,223**	**750**	**1,064**	**-4**	**109,336**

note a: criteria pollutant emissions reported in short tons; GHGs reported in metric tons

note b: a positive number indicates net positive emissions compared to the baseline

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